

Darrach (W.)

LECTURE,

Introductory to the Course on the

THEORY AND PRACTICE

OF

MEDICINE,

IN THE MEDICAL DEPARTMENT

OF

PENNSYLVANIA COLLEGE.

Session of 1846-47.

BY W. DARRACH, M.D.

Box 3-
29421

PHILADELPHIA:
KING & BAIRD, PRINTERS, No. 9 GEORGE STREET.
1846.

CORRESPONDENCE.

Philadelphia, November 10th, 1846.

Prof. W. DARRACH.

DEAR SIR :

The undersigned, a Committee selected from the Class in the Medical Department of Pennsylvania College, have the honor to solicit a copy of your Introductory Lecture for publication.

In discharging this pleasing duty,

We are respectfully yours, &c.

B. D. HOLCOMB, Pennsylvania.
A. MACDONALD, Nova Scotia.
W. L. FOSS, St. Croix.
G. W. KNOBLE, Germany.
GEO. GUIER, Jr., Pennsylvania.
E. W. CUNNINGHAM, Tennessee.
WM. W. ESTABROOKS, N. Brunswick.
JOHN SMITH, Virginia.
H. BURKLEO, Illinois.
H. A. JEWETT, Massachusetts.
WM. H. HULL, Maryland.
A. B. WILLIAMS, Michigan.
THOS. S. HOLLINSHEAD, Pennsylvania.
C. J. FREELAND, North Carolina.
B. R. FITCH, Vermont.
JOS. B. SUDLER, Delaware.
A. F. M'INTYRE, New York.
J. F. ADOLPHUS, Jamaica.
CHRISTIAN BLASER, Ohio.
JOHN E. WHITESIDE, Pennsylvania.

Philadelphia, December 31st, 1846.

GENTLEMEN :

With my hearty compliance to your polite and complimentary request, and my regret that the Lecture in question is not more worthy of publication, permit me to take this opportunity of expressing my abiding desire for your welfare, and for that of each member of the Class.

Your obedient servant,

W. DARRACH.

To Messrs. HOLCOMB, MACDONALD, FOSS, } Committee.
KNOBLE, and others. }

Introductory—1846-47.

GENTLEMEN—

The topic which I have been induced to select as an introductory lecture is Life. Before I discuss it permit me to tender you the usual, and at the same time, most heart-felt welcome to all our Philadelphia medical schools. Hitherto, we have been the youngest of them; and now there is yet a younger—the Franklin Medical College of Philadelphia. Prosperity to her laudable efforts!—Long life to her! In her name and our own we welcome you. In that of our elder sister, the Jefferson College, in her beautifully remodelled edifice; in that of the University of Pennsylvania, the venerable and beloved mother of us all; in the name also of the departed and never to be forgotten worthies, Rush, Wistar, Barton and Physick, patriarchs of American medicine—and higher yet, we welcome you in HIS Name, the Source of life, in whom we live.

Life!—This is my topic. It is, I am sufficiently aware, a trite, mooted, vexed subject. Nevertheless, I venture to call attention again to it. First, because a teacher of the theory and practice of physic is expected to deliver his doctrine on it; second, because writers on vitality have either reasoned without experience, or without revelation; and third, because we shall, I hope, come to better conclusions than theirs, by throwing upon this important subject, the combined light of both revelation and experience.

Then, what is life? I begin my answer to this question by propounding another, viz., what is not life? and by venturing, in answer, to say that it is inorganic matter. Inorganic matter is not life. This position may require some elucidation.

Blot out, then, in your imagination, the animal and vegetable forms, the minerals, the atmosphere, and all else, which, composed of definite proportions, have a separate and orderly existence; and what is left? I answer, a formless mass, consolidated by gravitation—heterogeneous element in unrepellent contact—and also certain substances separated by the power of repulsion; nitrogen, for example, which forbids special organization; oxygen, ready to consume all forms. All this is inorganic and the negative of life. Nay! more—these inorganic elements are potencies; which destroy any special form of life; and which are doomed to be unrelated, lurid, void,

formless and unsatisfied. They are destructionists, repellent to each other, existing in perpetual discord, whose hand is against every one, and every one's hand is against them.

Let light shine on this dark chaotic death, and then successively exist, air, clouds, bounded seas, and dry lands: and between these harmonious and those discordant existences there will be established a constant contest. This will produce, first, an inapt condition of the atmosphere in extra and protracted moisture, in extra and protracted dryness, and in sudden changes of its temperature; second, in extra positive and negative states of the electric fluid, and like varying conditions of similar fluids, or, to speak in accordance with Faraday, in the unbalanced condition of the various modifications of the one all pervading imponderable, whose phenomena are light, heat, electricity, and magnetism; third, in the principle of poison, of virus, of miasm; fourth, in items, which are incongruous and unassimilatable from their quality, quantity, and untimely application. These resulting inaptitudes are secondary destructionists, "the arrows of death;" and in union with the primary ones constitute what Schœnlein terms the Planetary Principle—the opponent of life.

If, under the tyrannical and universal reign of this destructive principle, man and subordinate forms of life are permitted to exist, they will need a defensive antagonistic principle. This we all possess. It is our fortress, our castle, our armor. The distinguished teacher of pathology already noticed, has called this protective principle the egoistical principle. By it, says Schœnlein, we are all constantly exerting an inherent power to separate ourselves from creation, of which we are nevertheless a constituent part, and are sustaining ourselves as independent beings; whilst all the rest of the universe is constantly and effectually tending to draw our special life into combination with its own inorganic self—inorganic against organic, and vice versa—the planetary against the egoistical, the egoistical against the planetary principle.

These principles, separately considered, have, under various other names, been long known in medicine. But considered, as by Schœnlein, in connexion with each other and as antagonistic, they not only make new impressions, but give new insight into the silent workings in the microcosm of vital forms, and discover to us the fact, that life is that mysterious energy, by which we act protectively, defensively, and continually, against the countless aggressive and injurious forces of the universe, which are as near to us as our breath and food, and, to use the words of Huniboldt, as far off as the inorganic stardust which floats as nebula in the heavens. They tell us, that life is possible, and that its perpetuity is impossible, until by another law, the Great Law-Giver and Creator shall make

mortal immortal. They tell us how we live, how we die, of health, disease and restoration.

Unintentionally, my remarks have gone, I perceive, beyond the consideration of the proposed negative question, "what is not life?" and have extended into the main question, "what is life?" and so much so indeed as to have perhaps sufficiently proven the truth of one of the three propositions which I propose to sustain.

My three propositions are the following :

First. Life is that principle in us, by which we are enabled to resist the destructive inorganic powers.

Second. Life is organism.

Third. Life presents itself in three forms, vegetable, animal, and man.

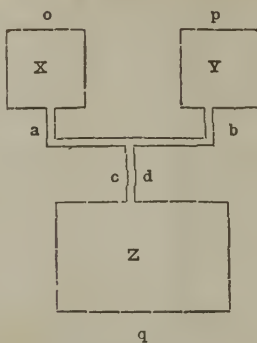
The first of these propositions has been sufficiently considered, and additional evidence in its favour will be reflected upon it in the exposition I will now attempt to make of the other two. The inferences, relative to disease, which the subject naturally suggests, must necessarily be postponed to the body of the course.

The second proposition, which then presents itself, is, that life is organism, i. e. organization acted upon by stimuli. Here we have terms, which need to be defined—organization, stimuli and organism; and, the defining of these terms will, I hope, fully expose the truth of this proposition. What then is organization? The answer which I will give to this question will doubtless have the appearance of novelty; and properly on this account, and also that it has not the palpable reality which an unqualified advocacy of Locke and Bacon may be supposed by some to demand, will not be so readily received; nevertheless it is as ancient as revelation.

What is organization? I answer, it is the union of matter and breath of life—a connate union. This is the doctrine of Thorburn; and which I adopt to the exclusion of all others. Receive it, and we will perceive more manifestly the prevalent errors on this subject. We will be convinced that organization is not, as has been vainly imagined by the vitalists, the effects of a presupposed undemonstrated vital principle; nor, as taught on the other hand, by the materialists, the result of an inherent power of material atoms to come together in definite proportions; nor thirdly, is it caused by a supposed single intelligent principle acting in each organic being by an energy and will of its own; nor lastly, is it the consequence of one universal plastic principle, a second agent, in fact, under the superintendence of the Deity. Organization is none of these. But, on the contrary, as a neutral salt is the result of a commingling of an acid and an alkali, so organization is the tertium-quid which results from the connexion of matter and breath of life.

Permit me to introduce here, Thorburn's happy illustrative diagrams, viz.

No. 1.

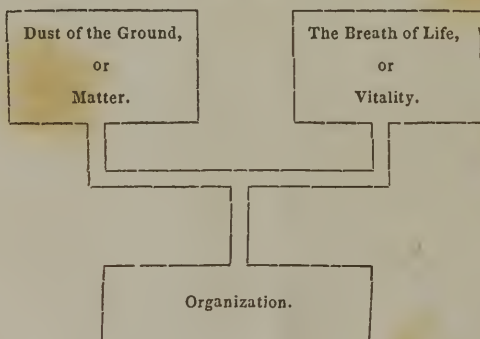


No. 1, X represents a definite quantity of an alkali, and Y of an acid in glasses of water, O and P.

Now suppose the manipulator simultaneously turns the stop-cock at (a) and (b), so that x and y shall run out of the glasses along the tubes (c) (d), and commingle in the common reservoir, q. What will be the result? The tertium quid fluid—for so it may be characterized—has not the properties of an acid, as one of its constituents x had while in the glass p, nor has it the alkaline qualities which its other constituent x had, while detained in the glass o. The fluid body z, in short, has characteristics peculiar to itself. Its behaviour, upon being tested in a liquid state, and the remains obtained by evaporation, declares it to be a neutral salt.

The second diagram, which is yet more easily understood, is intended to symbol forth, how organization may be supposed to have been brought about, thus—

No. 2.



Let us pause a moment, and ponder the expression, Nesh-math chah-yim, translated into English, "Breath of life." Who

breathed this nesh-math chah-yim? The Creator and Conservator! "He breathed into his nostrils the breath of life, and man became 'na-phech chahy-yah,' a living being." In some proper oriental sense, then, the breath of life is the breath of the Creator. The import of the expression, in the Hebrew, nest-meh clagin, is, according to the best critics, as I am well informed, the animating principle which renders the inert mass instinct with animated existence.

It is then, this "nesh-math chah-yim" in connate union with inert inorganic matter which constitutes organization. Organization consequently is a creation, and therefore not the work of a creature—not even of man. Man can educe, develop and by destructive analysis, can remand matter into its primary inorganic condition, and, to a certain extent, can recombine; but man cannot create. He cannot make a germ nor an ovum. These are organizations. These are matter in connate union with the breath of life.

The second term to be defined is "stimuli." Its meaning will be best disclosed by recurring to the above topic and asking why matter is organized, *i. e.* vitalized? The answer is, that in the simplest form of organization the vitalized matter may be nourished by external substances and thereby reproduce itself. An organic being then must sustain relations to other beings, that is, it must be acted upon, or, in other words, it must be endowed with the indispensable property of *susceptibility*. Other beings coming in contact with it, must influence it. Its inherent quietude must give place to action, its stasis to motion: and subsequently,—and consequently, there will be an internal motion of its own parts, acting and reacting on each other; and the organization itself, as a whole, reacting on the primary impression made on its susceptibility. These reactions result from its egoistical principle; which may be properly regarded as the other and associated property of organization. Whatever then can so impress an organization, and can so be reacted against by it, is a stimulus to said organized being: and more than one will be stimuli. Now as these actions and reactions are within an organization among its parts, and also without between itself as a whole, and other beings in contact and more distant, there will naturally be two kinds of stimuli, *viz.* internal and external stimuli.

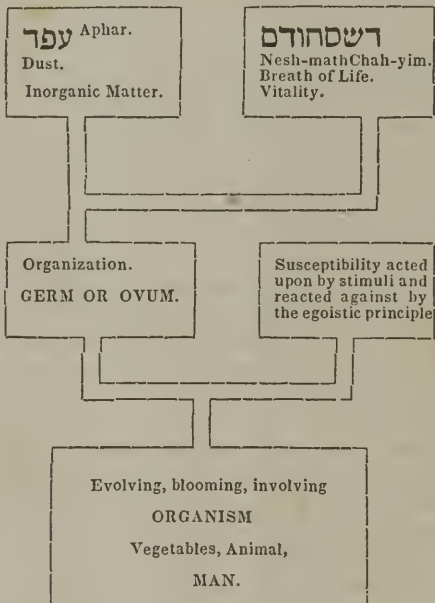
Again, it is evident, that although susceptibility, or, as it is more commonly termed, irritability, is a necessary endowment of every organization, without which the end of organization in becoming an evolving organism, could not be attained, and may therefore be properly called a property of organization, yet we cannot say, with the same propriety, that any being possesses a property of stimulation, seeing that one being is a stimulus to another, only in accordance with varying circum-

stances. Under these views, stimuli may be defined to be such things as severally produce on others, impressions against which the susceptible subject, by its egoistic principle, reacts.

We pass to the consideration of the third term to be defined, viz. organism, and therewith to dismiss this abstract portion of the lecture.

An organism is an organization in action by stimuli. It is the result of stimulated organization. An organization is quiescent and may remain so for ages, as, for example, a deeply buried seed. But when it responds to the application of internal and external stimuli it becomes an evolving, blooming and involving organism, manifesting all the dimensions, shapes, fragrance, colors and hues, and also, all the actions of the vegetable and animal kingdom. An acorn on the branch, attached, as by an umbilicus, to its mother, and an egg, in the cloaca, are organizations; but the oak and eagle are organisms, and so is man.

Diagram No. 3 will, perhaps, more satisfactorily explain this subject of organism.



The terms organization, stimuli, and organism, having been now defined, the question, what is life, recurs under its second answer. And we are enabled to say, that life is not only that principle in us by which we resist the destructive inorganic powers, but also the sum of the phenomena of the primary action of stimuli on susceptible and reacting organization, and of

the subsequent evolution of the organism. Life then is organism.

The third proposition to be considered is, that life presents itself in three forms, vegetable, animal, and man. Let us spend a few moments of our allotted time in a cursory consideration of each of these forms.

And, first, of the vegetable form of life. Here, upon the threshold of this topic, we are arrested by a question of more than mere captious criticism, viz. is life predicable of vegetation? Moving creatures have life; but is it in creatures which have no self-motion? Observation affords no direct answer, and revelation limits the use of its words, **חַיִּים** *chah-yim* and **נַפְשִׁים** *naphesh*, to that species of existence which imparts voluntary motion.

It is true, that in what is called the sensitive plant, opposite leaves seem instinctively to elevate themselves and to come into close contact with each other. The morning glory and similar plants wrinkle and fold up their corollas as though to roost for the night. The tendrils of creeping plants take hold of walls and other rough surfaces with apparently an insect's volition. And the venus-fly-trap opens its lid to catch an insect, seemingly with as much design as the anteater does when he projects and retracts his long glutenous tongue. These are not, however, instances of self-motion, but the passive result of stimulated susceptibility.

If then, the words *chah-yim* and *naphesh*, relate only to self-moving creatures, their application to beings, which are only growing creatures, is inadmissible; unless, indeed, we may venture to infer that this application would have been made, had the purposes of revelation demanded as full an exposition of the vegetable as of the animal kingdom. But, be that as it may, is it not true, that as the moving creatures which have life, live and move, and have their being in Him, their creator and preserver, so merely growing creatures also, although they do not move, must, nevertheless live, and that in Him. Can it then be improper to say of plants, that they are growing creatures which have life?

Such reasoning, however, is but inferential, and affords no demonstration of the point in question. What answer will consciousness, i. e. common consent, give? It is affirmative. Animals and man abhor and turn from lifelessness, but not from plants. The dove from the ark may have instinctively feared to stretch its wing over a waste of water, but doubtless the olive branch enlivened it. Architecture, no less than sculpture, and also machinery and fabric owe their attractiveness to association, direct and indirect, with no less the forms of merely growing than of self-moving creatures. Remove either of these, with the imitations of them by art, and we, becoming thereby

depressed, soon begin to long for some outward form of life. When such appear, especially if it be one of our own species, and more so, the form of that "friend we go home to," our feelings of desolation are gone, and we are comforted and satisfied. So, though in a lessened degree, would it be, if the vital form be only that of an animal, a prisoner's spider, for example, a fish, a bird, or the faithful dog which the untutored Indian expects to bear him company beyond the grave. These have all, for merely their vitality, been honoured with human friendships. Fremont, alone on Pike's peak, elevated above the ordinary region of animal life, is suddenly surprised by a butterfly alighting upon him most familiarly. And no wonder that it did so alight. This insect and Fremont were kindred beings, and each of these forms of life were less strangers to each other, than to the lonely height to which they had both wandered. Instinct contended with science for a while, which last would extinguish this winged vital form, to make it a cabinet specimen of the naturalist. Such are our sympathies with the allowed forms of life; and we venture to assert, that they are measurably the same with any and every form of vegetation; because the same filiating thread, the breath of life, the nesh-math chah-yim binds man, animals, and vegetation in the same mystic category of kindness. Test it. If I, for example, or rather any one of you, were depressed with intolerable lonesomeness, as one ostracised, in the horrid midst of a noiseless and formless desert, where, save the dry air, there is only the inorganic powers of destruction. There, suddenly appearing, your gaze is fixed, first, upon a small pimple-like rising on the flat sand, and then, from out of it, upon a growing, green and slender form. Loneliness and depression are then ended—the spell is broken—the wilderness is populated. Joyfully and quickly you near the kindred being, and, as would a Hebrew, so you instinctively exclaim *chah-yim*, and call it *naphesh*. It has neither brain, nerve, nor muscle. It has not the endowments of perception, volition, nor self-motion; far less has it a soul, yet your consciousness testifies that the growing and merely growing creature has life. It is an organism. You, like Charney, pause, to notice its progress. And, wondering what will be its leaf, and flower, azure, pink or scarlet, you impatiently and passionately exclaim with the prisoner of *Fenestrella*, bloom, *picciola*, bloom and reveal yourself in all your beauty, *la a povera picciola*. And with the Count, you experience pleasure in the mere pronounciation of a name which unites in your mind the image of an object which removed your loneliness. Vegetable and animal forms have indeed been strangely and strongly attached to each other. These non-sentient beings, as well as moving creatures, have been made the object of superstitious regard; and that by leaders of mankind and by imperial

nations. Pythagoras made the common bean the medium of metempsychosis. The lotus in whole and in its several parts, are equally with the ibis, important elements of the Egyptian hieroglyphics. And, in like manner, has superstition consecrated the Homeric holly, the palm tree of Latona, the odin-oak, the Roman fig tree, the Athenian olive, the mandrake of the Hebrews, the campac, the touba tree, and the magic camalata.

First fruits were laid on Jewish altars. The rose of Sharon and the lily of the valley, are endeared emblems of Christianity. The amaranth is the emblem of immortality, and the cyprus, the yew, and the weeping willow bespeak silence, sadness and the grave.

Affection, as well as superstition and religion, add to the common consent, that there is a vegetable form of life. It is not the weak-minded and uneducated, but the strong-minded and most cultivated, who dote most on plants and their flowers. It is not only the blacking-boy in Nicholas Nickleby, whom poverty and deformity kept from human society, that, as a substitute, found companionship in his hyacinth growing and blooming in a broken blacking bottle. Byron, also, became restless and dejected, as a poet without his muse, if a fresh bouquet of flowers was absent from his study table—the rose, the jessamin, heliotrope and violet, the blooming cactus, cyprus vine and lily, blending their colours, mingling their fragrance, and contrasting their size and form to wake up and delight his wandering sense, and become the earthly dwelling-place of his muse. Byron was sad without his flowers. Xerxes adored the majestic sycamore and caressed the plane tree. He slept enraptured under its shade, pressed its branch tenderly in his arms, and when compelled to bid adieu to his verdant favourite, he decorated it with bracelets and chains of gold. The lone prisoners of Olmutz and the Bastile, doubtless had a deep-seated instinct that plants live. They would have admitted them into close friendship as living friendly beings, and with one consent would say that the word of revelation, “naphesh” may indeed be extended to them. At the least then, may we not safely say, that one of the understood, unexpressed meanings of naphesh is *growing creatures which have life*. If so, I secure your pardon for this digression. The evidence, though only inferential, and resting also on common consent, may have produced in you the conviction which justifies the position, that vegetation is one of the forms of life. And is it not unequal to allow life to the moving worm of putrefaction and disallow it to the monarch oak?

I assume it, therefore, as a received truth, that there is a vegetable form of life. And as such, let us examine its organization, its stimuli, and the consequent evolution of its organism. The ultimate form of vegetation is a cellule. A cellule

is the type of the organization of the entire vegetable world. Cellule is organization. Cellule is the irritable tertium quid result of matter and breath of life. Such being a cellule, collocated cellules, myriads in number, constitute the integral organization of the vegetable germ, which acted upon by stimuli, viz. light, heat, and moisture, become a vegetable organism. As such it pushes a radicle downward, and a plume upward, varying in form, size, colour, and duration, whilst it makes its stalk or trunk and its branch, and tendril, and leaf, and flower, and germ containing fruit. The evolution is by external deposition of concentric cylinders augmenting in thickness to an ordained acme, and then diminishing in it. The grass, herb, and tree severally obey the special ordinance of their vital existence, and present various forms of development, but they are all a cellule-organization for nutrition and reproduction. They have neither brain, nerve nor muscle, and therefore are without voluntary act or motion. Their tendrillings and creepings and other imitations of voluntary motion are only the results of stimulated irritability. Such is the vegetable form of life.

We pass to the consideration of the second form of life, that of animals, a more complex form. It consists of an organism for nutrition and reproduction more complicated than that of vegetable, and of an additional one for perception, volition, locomotion and prehension; and of connecting media of them. The vegetable organism effects two objects, nutrition and reproduction. The co-ordinate and blended organisms of animals effect six, viz. nutrition and reproduction more complicatedly, and perception, volition, locomotion and prehension, thereby enabling and fitting the more perfect being to move about and take care of itself.

These co-existent and united organisms, which distinguish the animal kingdom, more especially its higher classes, demand separate examination. One of them is properly termed the nutritive, reproductive organism; and the other, with equal propriety may be called, the organism of animal life, being the additional organism of which vegetation is destitute, and which implies the addition of brain, nerves and locomotion and prehensile apparatus.

Let us examine them. And first, the nutritive reproductive organism of the animal form of life; its intimate structure, its complication and its unity.

The structure of its organization is a cellule as in the vegetable. This animal cellule is an interlaced, areolar, extensible and retractile texture with various containing fluids. These fluids and the solid texture are, each of them, like the vegetable cellule, a distinct organization, each of them being matter in connate union with breath of life, and each having suscep-

tibility to be acted upon by stimuli, and the egoistic principle of defensive and preservative reaction, as the two inherent properties of organization. This animal organization, as a whole, is acted upon by external stimuli; and its solid and its fluid parts act and react upon each other, as reciprocal internal stimuli. These external and internal stimuli continue to be operative until, by a law which governs the evolution, bloom and involution of each class of animals, the susceptibility to stimuli is exhausted and its egoistic principle is extinguished. Such is the intimate structure and properties of the animal organization.

The resulting organism is complicated. A plant with its germ self-appropriates light, heat, air and moisture, and for these purposes needs only a capsule, radicle, leaf and flower; the complement of its organism is for fixing and securing a location. A vegetable organism is therefore necessarily simple. That of an animal is not so, because it self-appropriates not only light, heat, air, moisture, but also minerals and vegetables and subordinate animal organizations and organisms. Performing many more functions in nutrition than a vegetable, an animal needs more instruments; some to collect, receive and fabricate a raw material, some to transport and appropriate the fabric, and some to reject the refuse, or, in professional language, there is a necessity for the complicated organs of assimilation, circulation, deposition and excretion. A closer examination will disclose yet greater complication. Each of these constituents of the organism is itself a system more or less extensive. The kidneys are the centre of one of the most limited of them, having as its associated organs, the renal veins, capsules, ureters, bladder and urethra. The liver is the centre of one which has, as its subordinates, the biliary and portal apparatus; being all that is necessary for *fœtal* nourishment, and after birth that which is necessary to fabricate carbon for animal heat. The associates of the heart are still more extensive. This includes not only the organs which vitalize the blood, viz. the lungs or gills, &c., but the ubiquitous arterial system, nourishing not only every organ of the nutritive reproductive organism, but also every part of the animal organism. The stomach is another centre of organs equally numerous and of universal sympathies. Such is the complication of the nutritive organism of the animal form: that of reproduction is measurably so.

In this complication there is discoverable, however, an admirable unity. The components, diversified in form, location and distribution, with their numerous and dissimilar functions, are bound into unity by a peculiar vital matter unknown in the vegetable kingdom, viz. nervous matter; a matter as vital as the vegetable cellule and animal texture and fluid above noticed. It is a peculiar organization, having its own peculiar

susceptibility and egoistical principle. Its forms are that of lumps, network and filaments called ganglia, plexus and nerves, which together constitute what is called the gangliar system. This system is arranged in the line of the animal, the nerves passing off from it in every direction to effect three objects: viz. first to supply an independent unconscious gangliar nervous influence to each organ of the nutritive reproductive organism; second, to distribute the same influence of organic life to the whole arterial system even in its traversings into the animal organism; third, to send filaments to the spinal marrow to establish the important connexion between the two co-ordinate organisms, by which the animal becomes conscious of pathological action in functions of nutrition and reproduction. It is by this gangliar system that a sympathy is established among all the organs and functions of the organism in question, and in that sympathy is the harmonious action of all its variously diversified parts.

Such is the structure, complication, and unity of the nutritive-reproductive organism of the animal form of life.

We come next to examine its co-ordinates, viz: the organism of animal life. It adds perception, volition, self-locomotion, and prehension, making thus the sentient being. The constituents of this organism are brain, spinal marrow, motor, and sensitive nerves, organs of motions, and an external or internal frame-work. These parts co-operate to enable the being to move safely and effectually.

It is done thus. External things impress the nerves of sensation. These transmit the impression to the sensorium. Perception, judgment, and volition are produced. And then volition sends its nuncii, the motor nerves, to effect some desired motion; either that for a needed adaptation of the senses, or for prehension, or for change of location. All this is imitated in the methods of locomotion by art, as, for example, that which is effected by the combined operation of the coach horse, driver, reins, and whip. The horse, by his head, makes an impression on an extremity of the reins. The reins, like nerves of sensation, transmit the impression to the driver. The driver, as a sensorium, perceives, judges, and wills an onward motion. The whip, as a nuncient nerve of motion, influences the muscles of the horse and the desired motion is made. This human contrivance and the sentient organism have one purpose, viz: change of place. The latter makes animals moving creatures, the sha-retz of the Hebrew.

The form of this organism is infinitely diversified. It shapes the animal. I would here call attention to the interesting fact, hitherto unnoticed, that whilst vegetation necessarily owes its form to the nutritive organism, that of animals is owing to the sentient organism. In these moving creatures, the nutritive

organism is compacted in the two truncal cavities, and the other give the size and outline of the sentient being itself. Pre-eminently is this true of the vertebrata. Aquatic creatures, the fish and bird, our models for navigation, have their forms determined by prescribed motions in media of less and varying specific gravity: And, besides, these well adapted forms are made buoyant by internal air apparatus. The fish has a contracting and dilating air bladder. The bird has a perforated lung, through which air passes into the warm cellular tissue of the abdomen, into the bones, and into the filaments of each feather. It is thus the whale descends and rests in the unfathomed depth of the ocean; and the eagle reposes in the upper sky on a quiet wing.

Mammalia have their forms from prescribed movements on the surface of the earth which produced them. Their various modes of prehension, defence, and locomotion have caused the bimanus, quadrumanus, canassiers, rengems, edentes, pachydermata, and ruminans; and have also caused all the varieties in the form, size, and number of the teeth, the varying power of the senses, the modifications of the extremities and of the neck.

These diversified adaptations might seem to imply an unavoidable irregularity in the sentient organism of animals. But, on the contrary, there is, Bichat has discovered, a most admirable symmetry of form and a consequent harmony of faculties, which is in striking contrast with the actually existing irregularity of the nutritive organism.

Each organ of sense has its analogous organ. The brain has its two hemispheres. Each motor and sensitive nerve has its opposite; and so each rib, and limb, and process. Accordingly, also, there is unity of impression from the double senses; and the fin, the wing, the arm, the leg of either side keep time; so that schools, and flocks, and herds, and armies of soldiers make their marches for weeks and months, with an unbroken rhythm.

This organism intermits its actions with perfect regularity. It is subject to exhaustion, relaxation, and insusceptibility. It sleeps and thus recovers its powers. The brain, the centre of the sentient organism, sleeps and that with regularity, and so sleeps also the spinal marrow, and nerves, and muscles. But the heart, the centre of the nutritive system, never sleeps. It continues day and night its ceaseless action, and so the lungs, stomach, intestines, liver, and kidneys: which answer affirmatively the question, viz: is there nocturnal growth of plants and animals?

The vegetable and animal forms of life have been, perhaps, sufficiently considered. We leave them, therefore, with some

short concluding remarks on their prominent differences, viz: first, The vegetable form of life is a single organism; the animal form is a double organism. The former effects two objects; the latter effects six of them. The one, fœtus-like, implants its placenta-like roots into its mother earth, the other enjoys, as after birth, a separate and independent existence.

The third and last form of life is that of man.

The great question, "What is man?" is pressed upon us. Surely he is more than animal. "A worm! a god! an insect infinite." He has a triple and transcendent nature; sense, intellect, and soul—functions, faculties, and spirit, a nutritive, reproductive and sentient organism. It was with us a difficult argument to lift vegetation within the precincts of vitality. It will be found a more difficult one to confine man within its boundary. He is more than a mere moving creature which has life. He was made in the image and likeness of his Creator, to have dominion over all inferior beings. We have risen high in the scale of being when we have come to the consideration of man. Inorganic matter is, as it might seem, a refuse, disregarded by the Creator. The atmosphere and minerals are atoms in definite proportions to manifest that He is a God of order. Plants show more his wisdom in evolution, bloom and reproduction; and animals still more in an additional organism for voluntary motion, and self-defence, and preservation. Man illustrates not only His wisdom, but His pity and love, which fill the universe with their fragrance, as the frankincense of a temple; and which will live, when the topic of my lecture is no longer life. Then what is man?

First, man is a *nutritive organism*. His beginning, or rather the first manifestation of his being, is a red, pulsating point. It floats in a pellucid fluid contained in a transparent ovoid sac. The sac is the amnios, the fluid is the liquor amnii, and the pulsating point is the primordial of the human heart. It is a red globule—a membrane enclosing a fluid which has a central consistence. The membrane is an interlaced, areolated, extensile, and retractile texture, i. e. matter and breath of life in connate union—an organization. The contained fluid is also an organization. The two organizations reciprocally stimulate each other, and changes result in an ordained series. The globule becomes the sacculated portion of a ramifying tube filled with a red fluid, the blood. Other sacs form about and communicate with it, and are elongated into another set of branching tubes, the veins, communicating with the former by means of a reticular set of vessels, the capillaries, and thus a circulating apparatus is made.

The circulated blood is variously deposited as plastic matter. Here a cylindrical coil, the intestine, appears having a

dilated portion, the stomach. There appear two parallel white cords, the symmetrical portions of the spinal marrow, and hemi-spheroidal enlargements of contiguous ends, the primordial of the brain. Fine silvery threads pass off from right and left making the symmetrical system of nerves. In another location is to be seen the detached gangliar system. And thus come into existence all the parts of the two co-ordinate organisms. The nutritive organism being perfected, or greatly so at least, is at work to advance the sentient into a state fit for birth and detachment from the mother. Such is man in utero. He seems there to only vegetate, destitute of intellect and deriving nourishment, as a plant, from vessels rooted in the mother.

Second, man at birth is a nutritive and yet a still formative sentient organism. He breathes, and thereby becomes as dependent on the atmosphere as he had been on a placenta. He sucks, and thereby is still dependent on a mother. Light, it is true, now stimulates his eyes, but there is yet no intelligent wink. Sound impresses the membrane, fluid, and nervous pulp of his ear, but the impression does not reach his soul and unlock attention and speech. The almost perfected organs of sense are duly excited by external stimuli, but the cerebrum is not sufficiently developed, the infant's forehead is flat. There is, in fact, no volition, no moral agency yet, and consequently, no voluntary motions—the instrument of these motions, viz : the arms and legs, and the organs of speech, are indeed themselves not yet developed.

Manifestly then, although the nutritive organism of man is at birth sufficiently perfected, his sentient organism is very incomplete. Man, at this period of his existence, is very dependent. The young of fish are off as soon as spawned; the young ostrich is the foundling of the desert; the eagle, after a short and impatient nestling, breaks up the nest to drop her eaglets upon the high cliffs below her yet higher nest; but infant man still needs the mamma, a mother's arms and care and years of paternal training, until the cerebrum and organs of self motion and protection shall have slowly attained their perfection. But having, like a conquering hero, once attained it, whilst one-half his race have not, man becomes the noblest of creatures. His evolution, like that of the cactus grandiflora, has been slow, but like it also, his bloom is splendid. Behold him in the completeness of his physical nature. He is erect. He is firm as a solid cube, yet pliant and as easy and varied in motions as the rolling sphere. Examine the inimitable mechanism by which these contraries are so harmoniously effected. Measure the transverse parallel lines which make the breadth of the feet, hips, and shoulders, and the

erect form of man will be shown to be an inverted cone resting on its apex, or at least on a small truncated surface. Apparently how insecure is this position ! And it is apparently more so, if we study the relation of parts in the bony pile which makes the hidden frame-work of this form. The entire pile itself is not only an inverted cone, but it rests its entire weight so insecurely upon a small arch as to demand a propping up by the bones of the *policis magnus*. The key-stone of said arch is, most hazardously, moveable. The vertical leg-bones sustain the thigh-bones at an outward angle, and do it as skilfully as a performer balances rods one upon the end of the other. The heads of the femur, owing to their angle with the shaft, afford but slight resistance to the splitting effect of the wedge-formed sacrum. This, on its base, supports the spine, a sigmoid pile of many bones so adapted as to be equally firm and flexible. This supports an unbalanced skull and an unbalanced set of thoracic bones.

It is then most demonstrably true, that man's bony frame-work has no inherent stability. As a whole or in parts, it will fall. On what then depends his erectness and stability ? Phidias, having chiselled out the form of man, put it on the feet, vainly expecting it to stand without an external prop.—It fell, and so would any one of us, if there were not a power in man to resist and overcome the power of gravitation, the great leveller and destructionist. Wherein then is our physical rectitude and stability ? I answer, they are strangely to be found in the organs of motion, the muscles ; organs of motion are paradoxically, in man, the organs of erectness and stability ; whilst the bones, properly the organs of stability are paradoxically the organs of motion. Thus, by a double equivalent in vital mechanics, which surpasses imitation, man is as stable as the pyramid and the rooted oak, and yet can move quickly or slowly in every line of every section of the cone. The same admirable use of mechanical paradoxes is noticeable in the leverage and hydraulics of the human structure. The fulcrum approximate the powers. The same arborescent disposition of vessels, by one adaptation, retards the circulation and resists gravitation which would injuriously hasten it ; and by another, accelerates the circulation against a retarding power. By an hepatic and a pulmonary co-operation man sustains his own peculiar temperature against the varying powers of heat and cold. By organs of sense, he wisely selects and appropriates. And by his intellect, he is reducing the earth's surface to order, erecting cities, building navies, bringing into view things extremely minute and distant, shortening space and communicating thought with the rapidity of light.

Man certainly is the most perfect specimen of the two co-

ordinate organisms. But like all such, he blooms in order to fade. His faculties and functions, after having done wonders, must bend down from a culminating stage, to pass through senile atrophy to the dust, as an embrowned leaf of autumn. Here then ends the examination of man, as the third and last proposed form of life. He has a nutritive, reproductive organism in common with plants, from the palm in her rich soil and warm dews, to the *discerea nivalis* among the snows of the loftier mountains. And he has this organism in connexion with the sentient in various degrees towards perfection, with animals from the great cetaceans and pachydermatous tribes, to the silicious shelled organisms of the polar ice. All organisms have a common nature. They make an extensive fellowship, not of man with man of every race and family of man only, but also of man with every plant and animal, of every plant with man and animals, and every animal with man and plants. We are all—plants, animals and man—fellow beings, having a common life, a *chah-yim*. And each of us evolve, and bloom, and return to dust.

Such is man physically considered, a form of life ! the highest form of life ! And here I might terminate my lecture and release your attention ; for I have now considered my three propositions as an answer to the question, “What is life?” But there is another question raised by the general tenor of this lecture, which must be answered. Is man nothing more than a nutritive, reproductive, and a sentient organism, a being resolvable wholly into dust, into *aphar*, as a plant and an animal ! a mere *sharetz na-pheth chah-yah*, a moving creature that has life—a life dependent on organization—a result of stimulated organization—a physical existence subjected to time and space, a mere thing, not a person, of which virtue is therefore not predicable, nor vice, and whose acts, therefore when not in accordance with the comforts and welfare of society, are only irresponsible acts of insanity. Is man only this ? Sad ! sad ! Is this the whole of man ? An irresponsible, soulless being ! If so, then why is the sacred word *רוח* *Ruach*, in revelation applied to man, and to no other creature inferior to man. He alone on earth is spiritual. A passage in revelation, respecting the nature of man and animals, may here be quoted with great propriety and force. Referring to the horses of the Egyptians, it is written : their horses are flesh and not spirit, not *Ruach*. This sacred word is not a synonym with *לפש*, *na-phesh* and *חיים* *chah-yim*. These always, in their various applications, relate to visible and material existences, while *Ruach* invariably means spirit, *Ruach Elohim*, the spirit of God ; *Ruach Ha-adam*, the spirit of man.

This then, makes man more than a physical existence. Be-

sides the perishable organisms for nutrition and reproduction and for sensation, perception, volition, and self-motion, there is the immortal Ruach. This Ruach, not subject, like organic matter, to evolution, bloom and atrophy, exists before the cerebrum and the mean fleshy mental faculties are fully developed, and as brightly and immortally still, when from age, or premature disease, or a moribund state, both corporeal faculties and functions are impaired or extinguished. Still, the Ruach lives, as the flame in Horeb's bush.

I distinguish then the immortal spirit of man from all that *mind* which depends on *organization*, and which may be the proper subject of a pure phrenology. I do not confound them. The *intellectual faculties* and man's *spirit* are not the same, yet I know nothing of the mode of their connate union. I know not how it is, that there is the evolving, blooming, and atrophic faculty of memory; and also, that the eternal spirit of man has memory, and that it is said in the parable, in reference to the spirit of a rich man separated from the body, "*Remember* that thou, in thy lifetime," &c.

Certain knowledge on this point must come from some one who shall combine the powers and varied directions of mind of such men as Locke and Jon. Edwards, Bacon, Sir Isaac Newton, Dalton, Sir Charles Bell and Le Verrier. The logic which has demonstrated the freedom of the human will, analyzed the mental faculties, and, reasoning on the variation in the course of Uranus, declared the existence, location, and magnitude of another, and as yet nameless star; the analysis and experiments, which have separated the sun's ray into its calorific, colorific, and chemical constituents; which have discovered, that material atoms combine in definite proportions; and that nerves, with few exceptions, have each one filament to excite motion, and another to excite sensation, are praiseworthy attainments. But that will be a higher analysis and a more glorious experiment which shall so demonstrate the human mind as to show separately, first, the perishable intellect dependent on organization, second, the immortal responsible spirit, and third, the mode of their mystic union.

As yet, we are ignorant of the manner of this union. The fact of it, however is believed in. The immortal spirit of man, in some way or other, incorporates itself, to raise and sustain the mean intellectual faculties above brutality. Light incorporates itself with the atmosphere; and this, thereby, becomes the enlightened and vivifying atmosphere of day. It departs, and there remains only nocturnal air, contracted, cheerless, and deadly. So, permit the analogy, the immortal spirit is infused into intellect to constitute the spiritual human mind. It

emanates from, and surrounds the living organism as a halo. It gleamed in the eye of the prophet Daniel in the den, and tamed the lions into lambs. It was the Ruach which was addressed and reached by the holy eloquence of Paul and all the apostles and ministers of Christ. Thereby the Macedonian, the Roman, and the Corsican led about conquering armies as a magnet the filings of steel. It is this, which, longing after immortality, and dreading annihilation, strives after an indefinite extension of his being. It is this which commands the faculties of the intellect, wakes up the emotions, and which, by resisting or yielding to evil, imparts responsibility and subjects man to obedience. It is this, by which man loves his neighbour as himself, and his Creator and Redeemer supremely, or by which he hates, and therefore would dethrone, usurp, tyrannize and destroy—not because he is insane. This hatred and its evil acts are not the excusable effects of an exculpating insanity.

The nature of insanity is physical. Insanity appertains, not to the Ruach, but to the na-phesh. It is predicable of our animal organic nature, not of our spirit. The brain, the organ of the mental faculties, perception, memory, imagination and judgment, may become, like the other parts of the body, the subject of disease, and these faculties consequently will become disordered; hence the strange, incoherent, guiltless manifestation, which, if transient, is delirium; and, if continued without fever, is mania, melancholy, monomania, or dementia. The hatred in question is, on the contrary, the guilty emotion of the immortal spirit liable to the penalty of divine law; and the evil perpetrated thereby subjects man to the penalty of human law. This enmity is man's sad inheritance, subdued and ultimately destroyed by grace, or restrained by conscience, the moral code, human law, and Christian education. If he break through all these barriers, and acts injuriously, then the egoistic principle of society raises another barrier, viz. the penalty of human law; and if the act be against the Ruach in man, which is God's image, then the barrier is the penalty of His law, enforced by man. Evidently then, man is an immortal being. He is made in the image and likeness of his Creator, to have dominion, not over his fellow human creatures, except by special ordinances, but over inferior beings. He is thus the lord of creation. Hence, in its pageant, he comes in at the last, as a king into his waiting court; as the high-priest into the temple, at the fulness of the service. The sun, moon and stars are his lights. The thunder is his organ. The winged songsters are his choir, and the spicy south breeze is his frankincense. "And every beast of the field, and every fowl of the air were brought to him by his Creator to see what he would name them." And as a good shepherd would name each of his flock, so he gave names to all cattle, and to the fowl of the air, and to every beast of the field. The

sinews of his monarchy was love. Erect, under the canopy of the tall and spreading oak, he presented an expression of benignity ; and his subjects dwelt around him. The lion licked his right hand, and the eagle fed from his left. Such was man, and such he will be when he shall have regained his pristine state of gentleness and truth.